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(54) Title: TRACER HUNTING CARTRIDGE			
(57) Abstract			
<p>A shotgun cartridge has a tracer and a wad provided with a concentrator cup (6). The bottom plate (7) of the wad is provided with weakenings which break during firing so that the bottom plate slides forwards on the wad. The tracer is a spherical shaped element (23) carrying a cylindrical tail (24) in which the pyrotechnic tracer charge (25, 26) is located. The tracer (23) is disposed in a conical seat (18) of the wad. First tracer composition: 15-35 % magnesium powder; 30-50 % barium peroxide; 20-40 % strontium nitrate; 2-10 % chlorine. Second tracer composition: 15-35 % Mg powder; 40-60 % potassium nitrate; 20-30 % strontium nitrate; 2-10 % chlorine; 5-15 % binder. Third tracer composition: 30-40 % Mg; 10-20 % potassium perchlorate; 35-45 % strontium nitrate; 5-15 % binder.</p>			
<p>The diagram illustrates a cross-section of a shotgun cartridge. The components are labeled as follows: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28. The cartridge consists of a base (5) containing a primer (4), a wad (6) with a concentrator cup (7) and a tracer element (23) embedded in it, and a shotgun shell (28) containing shot (10). The shell is held in place by a cartridge case (27). Various other labels (1, 2, 3, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 24, 25, 26) point to different parts of the cartridge's internal structure.</p>			

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TRACER HUNTING CARTRIDGE

Field of the Invention

This invention relates to tracer hunting cartridge, which has a designation for hunting and sport shooting
05 with smooth bar weapons.

Background of the Invention

It is popular hunting cartridge - US P No 4841866, including cylindric shell with inflammable cap situated in its base and upon which is situated propelling
10 explosive, the upper side of which is enveloped by lower cross platform of a monolithic concentrator, including also upper cross platform and situated between two platforms cylindric spindle.

The lower cross platform has extended and directed
15 downwards periphering board, which is pressed densy to the inside surface of the shell. The upper cross platform ended with cup-like body, on the walls of which are formed lenghtwise cut-outs in two crossing plains. At central place in the upper cross platform is formed a
20 seat, the upper part of which is a cocavity with hemisphere shape, passing in lower cylindric. Along the outside surface of the cylindric spindle there are formed stiffening ribs, which lay down in plains, passing trough the axial of the concentrator and stand on equal distance from one
25 another and in the spindle there is an axial hole, which connect the propelling explosive and the seat.

In the above mentioned seat is installed tracing element which consisting of spherering ball ended with cylindric tail situated dense in lower cylindric part of the seat, where
30 the semi-diameter of the spheric ball is equal to the semi-diameter of the semi-hemisphere seat, which permit the tracing element to lay down densy with its lower surface

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to the surface of the seat. In the cylindric hole the depth of which reach a little after the center of the spheric ball and in the cylindric hole is pressed in pyrotechnical tracing composition, consists of barium super-
05 oxide 87 %, magnesium 11 %, strontium nitrate 2 %.

The faults of the know technical decision are in the lack of possibility for correcting the accuracy of each next shot, which is due to the following: in the process of shooting the presure in the combustion chamber increasing and arosed irregular deforming of the stiffening ribs of the spindle, where the parallelism between the upper and the lower platforms is destroyed and the result of which is that the axle of the concentrator deflected under an angle in comparision with the axle of the cartridge and barrel of the gun in the period of its movement in them.
10
15

After leaving the barrel of the gun, the deflection of the axle increases, which arose irregular opening of the walls of the cup-like body as a result of the air-resistance and leads to spinning of the concentrator in the period of its flying.
20

Simultaneously the densy contact between the seat and the situated in it tracing element delayed the separation of the above mentioned element from the concentrator. As a result of the tracing element in the period of its flight can not follow the central axle of the movement of the pellets sheaf and to stay in its nuleus till striking the target.
25

Another fault of the popular tracer cartridge is that it is not permit an optimum visibility with respect to the tracing effect because of insufficient brightness of the radiated light in the process of burning of the tracing composition.
30

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Another fault is the fact that it does not give a possibility for visual counting of the reached from pellets sheaf preliminary gave distance.

It is an object of the invention is to create a tracer 05 hunting cartridge shooting with to ensure bigger efficiecy expressing in bigger accuracy of striking the target, optimum visibility in respect to the tracing effect and also a possibility for visual couting of the reached from the pellets sheaf preliminary gave distance.

10 Summary of the invention

The object of the present invention is solved with tracer hunting cartridge, consist of cylindric shell with flammable cap, situated in its base and above this cap is powdered free propelling explosive the upper surface of which is 15 enveloped from cross platform of a concentrator, including also an upper cross platform and situated between two plat - forms spindle.

Along the periphery of the lower platform there is a oriented to down board, to the outside cylindric surface of 20 which is forming densy - ring which is touching densy to the inside surface of the shell and is interrupted along the diameter oposite from both sides.

The upper cross platform ended with cup-like body on the walls of which are formed at least in two plainy lenghtwise 25 slots, which separate the walls to equal number parts, connected in their upper end with uninterrupted ring,tiuching densy to the inside surface of the shell.

At central place in the upper cross platform is formed a seat the diameter of which in the lower cylindric part is 30 smaller than the diameter of the upper cylindric part.

In the spindle there is an axial-cylindric hole,connecting the bottom of the seat with the upper surface of the explosive and in the seat is situated ball-shape tracing element to

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which is formed cylindric tail with cylindric hole from the free-end side of the tail and in this hole is pressed - in pirotechnical tracing composition.

In the cup-like body of the concentrator are situated 05 pellets. According to the invention in the lower cross platform of the concentrator is formed concentric channel with section of right-angle trapezium and the diameter of its conical surface where the spindle has conic shape, which small diameter is equal to the big diameter of the 10 conical surface of the concentric channel and passed into cylindric stop channel with right-angle section, which diameter is smaller than the big diameter of the conic part of the spindle and is equal to the concentric channel and its width is equal to the thickness of the lower cross 15 platform, where between stop channel and the upper-cross platform is formed a shoulder with a diameter bigger than the diameter of the conic part of the spindle and the upper part of the seat is truncated cone - shape with an angle between forming from 70° to 120° and its lower cylindric 20 part are formed at least two diametric situated lengthwise channel with right - angle section and coming into surface of the seat and cylindric part of the seat is formed a holding ring with semi-circle section, separated by the lengthwise cut-outs on equal sectors, enveloping tail of the tracing element, which lenght is smaller than the depth of the 25 cylindric part of the seat and the ball of the tracing element is formed the tail in appearance of segment with radius R , laying in the conic surface of the seat and the upper part of the ball is formed in appearance of semi- 30 sphere with radius R_1 , smaller than radius R of the segment of the ball and the centers of the radii R and R_1 are situated along the axle of the tracing element on the distance from each other equal to $1/5$ from the radius of semi-sphere R_1 .

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According to a version of the tracer hunting cartridge the spindle connecting the lower and the upper platforms of the concentrator has cylindric-shape on the surface of which is formed under slope and symmetric to the axle of 05 the concentrator stiffening ribs standing on equal distances from each other.

Another version of the tracer hunting cartridge is distinguished with the fact that the bottom of the cylindric hole on the tail of the tracing element is formed in 10 the plain of crossing between segment and radius R of the ball and cylindric tail. The tracer hunting cartridge is distinguished with using of a tracing pirotechnical composition, which includes magnesium powder 30-40 %, potassium perchlorat 10-20 % strontium nitrate 35-45 % and connecting 15 substance 5-15 %.

Another pirotechnical composition which ensure optimum vision consist of magnesium powder 15-35 %, barium super-oxide 30-50 %, strontium nitrate 20-40 %, chlorine supplement 2-10 % and connecting substance 5-15 %.

20 A version of the tracer hunting cartridge ensuring visual counting of the reached from the pellets sheaf preliminary gave distance is characterized with the fact in the tail of the tracing element are pressed - in consistently in direction from the base of the hole to its bottom, basic 25 and additional pirotechnical compositions and the additional pirotechnical compositions and the additional composition in the process of burning radiate light which colour differed from the color of the basic tracing composition.

The priorities of the tracer hunting cartridge according 30 the invention are in the increased efficiency in the process of striking the target, which is a result from the possibility of the hunter to correct the precision for the next shot due to the information which takes from the tracing

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effect of the previous shot - the tracing element follows the central axle of the movement of the pellets sheaf and stays in its nucleus till the falling of the same in the target and simultaneously the tracing composition radiate 05 bright light and ensure optimum vision.

Brief description of the drawings

As an example-made the tracer hunting cartridge according the invention is shown on the enclosed drawings, where:

- fig.1 - lengthwise cut-out of the tracing cartridge
- 10 - fig.2 - lengthwise cut-out of the monolithic concentrator.
- fig.3 - top view of the concentrator
- fig.4 - lengthwise cut-out of the tracing element of the cartridge in fulfilment with basic pirotechnical composition.
- 15 - fig.5 - lengthwise cut-out of the tracing element in fulfilment with basic and additional pirotechnical composition
- fig.6 - lengthwise cut-out of a version sample of concentrator with cylindric spindle and stiffening ribs.
- 20 - fig.7 - side view of the concentrator from fig. 6
- fig.8 - cross cut-out A-A of the concentrator from fig.7

Detailed description of the Invention

25 The tracer hunting cartridge according the invention consists of hunting shell including cylindric plastic element 1, in the lower inside part to which is inmobileconnected lpastic sleeve 2 and the outside lower part of the cylindric element 1 is enveloped from metal cup 3, where in 30 the formed bottom of the shell is installed flammable cap 4. In the bottom of the hunting shell, upon the sleeve 2 is powdered free propelling explosive 5, which contact with the upper part of the cap 4.

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Above the propelling explosive 5 is situated monolithic concentrator 6, which consists of lower cross platform 7 through the periphery of which is formed lengthening and directed to down board 8, through the outside 05 surface of which there is densing ring 9 with semi-spherical shape, interrupted against the diameter.

In the lower surface of the lower cross platform 7 is formed concentric channel 10 with right-angle trapezium shape, which diameter is bigger than the diameters of its 10 conic surfaces. Above the lower cross platform 7 is situated conic spindle 11, oriented with its small diameter to the bottom of the shell, where the small diameter of the conic spindle 11 is equal to the big diameter of the conic surface of the concentric channel 10. The upper part of the 15 conic spindle 11 passed into cylindric stop channel 12 with right-angle section. The diameter of the channel 12 is smaller than the big diameter of the spindle 11 and is equal to the diameter of the cylindric surface of the concentric channel 10 and the width of the stop channel 12 20 is equal to the thickness of the of the lower cross platform 7. Above the stop channel 12 is formed resting step 13 with diameter, bigger than the big diameter of the conic part of the spindle 11. After the resting step 13 is situated the upper cross platform 25 form 14, in the periphery of which is formed cup-like body 15, on the walls of which is there is lengthwise cut-outs 16, passed through unless in two plains.

The formed in this process feathers are connected in the upper ends with the help of ring 17 with 30 semi-spherical shape, which outside size ensure dense contact with the inside surface of the shell. In central place in the upper cross platform 14 is formed a seat 18, the upper art of which has the form of truncated cone with an angle between the formings

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$70^\circ - 120^\circ$ and the lower part is cylindric where from its bottom to the down surface of the lower cross platform 7 passed cylindric channel 19.

In the cylindric part of the seat 18 are formed 05 four diametric situated lengthwise channels 20 with right-angle section, the upper part of which reach to the conic part of the seat 18, as the semi-sphere holding ring 21, separated fromm the lengthwise channels 20 of four equal sectors.

10 In the seat 18 is situated tracing body 22, consists of sphere-ideal element 23 and formed to it cylindric tail 24, which length is smaller than the depth of the cylindric part of the seat 18. The spherical element 23 is formed in its base in the 15 shape of segment with radius R, bigger than the radius R_1 of the upper semi-spherical part, where the centres of the radius R and R_1 are situated along the axle of the tracing body 22 in a distance from each other equal to $1/5$ from the radius of semi- 20 sphere R_1 .

In the cylindric tail 24 of the tracing body 22 is formed cylindric hole with bottom, laying down in the playin of crossing the segment of the spherical element 23 and cylindric tail 24. In the cylindric hole of the tail 24 is pressed in basic pyrotechnical composition 25, consists of heterogeneous powder 30-40 %, potassium perchlorat 10-20 %, strontium nitrate 35-45 % and connecting substance 5-15 % expressed in mass soles. The pirotechnical tracing composition 30 25 is chosen for illustration and is not purposed for defining of limiting the variable compositions, as as an example:

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magnesium powder 15-35 %, barium superoxide 30-50 %, strontium nitrate 20-40 %, chlorine supplement 2-10 %, and connecting substance 5-15 % or magnesium powder 15-35 %, potassium nitrate 40-60 %, strontium nitrate 05 20-30 %, chlorine supplement 2-10 % and connecting substance 5-15 %.

According a know version of the tracing body 22, in its tail are pressed in consistently in direction from the bottom of the hole to its base, basic and 10 additional pirotechnical tracing composition 26, where the additional composition 26 differed from the above mentioned with the fact that in the process of burning in radiate light, the colour of which differed from the colour of the basic tracing composition 15 25.

A variable decision of the situated in the hunting shell concentrator 6 is shown on fig. 6,7,8. This concentrator 6 consists of lower cross platform 7 with directed to downboard 8 and dense-ring 9, upon 20 which is situated cylindric formed spindle 11, along the outside surface of which are formed, under a slope, symmetric according the axle of the concentrator 6 four stiffening ribs 27. The spindle 11 is connected directly with the upper cross platform 14. In the cup-like body 15 of the concentrator 6 are placed free 25 lead pellets 28. The throat 29 of the hunting shell is enveloped in stars-like way.

The action of the tracer hunting cartridge can be shown in the following way: in the process of shooting the flammable cap 4 burns the propelling explosive 30 5, where the increasing during the burning gases increase the pressure in the burning camera of the cartridge, as a result of which the walls of the

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periphery board 8 pressed dense with the help of dense-ring 9 to the inside surface of the shell and did not permit to the gases to bore.

The further on increasing of the pressure in 05 the burning camera leads to tearing of the lower cross platform 7 in the field of the weakened section, placed upon the concentric channel 10. After tearing, the lower cross platform 7 moves axial and slides along the conic surface of the 10 spindle 11, till its fixing in the cylindric stop channel 12, as thanking of having the cylindric step 13 coming a demper effect, stopping the coming of remnants deformations in the seat 18. In this moment the concentrator 6, together with the tracing 15 body 22 and the pellets 28 begins to move sliding alonghe inside surface of the shell. The first shortened distance between the power 7 and upper 14 cross platforms ensure rectitude of the axle of the concentrator 6 and coincidence of it with the axles 20 of the cartridge and the barrel of the gun in its acceleration move in them, where the parallelism situation of both cross platforms 7 and 14 keeps thanking of the shown dempfy effect. The inertion powers, took from the acceleration move of the 25 concentrator 6 with the placed in it tracing body 22 and pellets 28 have a direction opposite of the acceleration, as a result of which the tracing body 22 stays to the seat 18 without tightening tanking of conic forming of its upper part, as the lack of 30 remnants deformations in it, simultaneously the gases separating in the burning of propelling explosive 5 penetrate through the channel 19 of the spindle 11

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and burning the basic tracing composition 25, which take place in the tail 24 of the tracing body 22. The separating in the burning of the tracing composition 25 gases passed through the lengthwise 05 channels 20 in the cylindric part of the seat 18 and reached to its upper conic part and acting upon lower surface of the spherical element 23 with power, counteracting of the inertion powers, but smaller than them. Thanking of the last, the tracing 10 body 22 and the pellets 28 continue to hold to the seat 18 and the upper cross platform 14 of the concentrator 6 in their accelerating move in the barrel of the gun. In the time of leaving the barrel the ring 17, formed in the upper part of the cup- 15 like body 15 tears from the air resistance, where the feathers opened up and the speed of movement of the concentrator 6 decrease. In the same time the pellets 28 prolonging to fly upon the acting of their own inertion powers and they separate from the surface 20 of the upper cross platform 14 and upper surface of the spherical element 23 of the tracing body 22. And the gases, separating during the burning of the basic tracing composition 25 act with definite power upon the lower surface of the spherical element 23, which 25 summarized with its own inertion power, in the period of delaying movement of the concentrator 6, helps for easy and duly separating of the tracing body 22 from the concentrator 6 and beginning of its independent flight along the central axle of movement of the 30 pellets sheaf, as it stays in nucleus till striking the target.

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In using of tracing body 22 with situated in the tail 24 basic 25 and additional 26 pirotechnical tracing compositions is appearing the next tracing effect - burning at the end, during the time of the flight of the tracing body 22, the basic tracing position 25 burns the additional tracing composition 26 and in that way ensures changing the colour of radiated till this moment, light till reaching of the preliminary gave distance, coresponding to the necessary for striking the target.

In using of tracer hunting cartridge, in which is situated concentrator 6, which is a version with stiffening ribs 27 is getting the following effect - in reproduction of a shot, as a result of increasing of the pressure in the burning camera of the cartridge, the lower cross platform 7 and the upper platform 14 are turning around the axle of the concentrator 6 in opposite direction definite from the slope of stiffening ribs 27, as a result is a demper effect, ensure keeping of parallelism between cross platforms after cutting of the first distance between them, as the stopping the creation of the remnants deformations in the seat 18.

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Claims:

1. The tracer hunting cartridge, including cylindric shell with inflammable cap situated in its base and upon which is situated propelling explosive, the upper side of which is enveloped by lower cross platform of a monolithic concentrator, including also upper cross platform and situated between two platforms cylindric spindle; the lower cross platform has extended and directed downwards periphering board, which is pressed dense to the inside surface of the shell; the upper cross platform ended with cup-like body, on the walls of which are formed lengthwise cut-outs in two crossing plains; at central place in the upper cross platform is formed a seat, the upper part of which is a concavity with hemisphere shape, passing in lower cylindric; along the outside surface of the cylindric spindle there are formed stiffening ribs, which lay down in plains, passing throgh the axle of the concentrator and stand on equal distance from one another and in the spindle there is an axle hole, which connect the propelling explosive and the seat; in the above mentioned seat is installed tracing element which consisting of spherering ball ended with cylindric tail, situated dense in lower cylindric part of the seat, where the semi-diameter of the spherical ball is equal to the semi-diameter of the semi-hemisphere seat, which permits the tracing element to lay down dense with its lower surface to the surface of the seat; in the cylindric tail of the tracing element there is a cylindric hole the depth of which reach a little after the centre of the spherical ball and in the cylindric hole is

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pressed in pirotechnical tracing composition and in the cup-like body are situated pellets, characterized in the lower cross platform (7) of the concentrator (6) is formed concentric channel (10), 05 with section of right-angle trapezium and the diameter of its cylindric surface is bigger than the diameter of its conical surface, where the spindle (11) has conic shape, which small diameter is equal to the big diameter of the conical surface of the 10 concentric channel (10) and passed into cylindric stop channel (12) with right-angle section which diameter is smaller than the big diameter of the conic part of the spindle (11) and is equal to the cylindric surface of the concentric channel (10) and its width 15 is equal to the thickness of the lower cross platform (7), where between stop channel (12) and the upper cross platform (14) is formed a shoulder (13) with a diameter bigger than the big diameter of the conic part of the spindle (11) and the upper part of 20 the seat (18) is truncated cone-shape with an angle between forming from 70° - 120° and in its lower cylindric part are formed at least two diametric situated lengthwise channels (20) with right-angle section and coming surface of the seat (18) and cylindric part 25 of the seat (18) is formed a holding ring (21) with semi-circle section, separated by the lengthwise cut-outs on equal sectors, enveloping cylindric tail (24) of the tracing element (22), which length is smaller than the depth of the cylindric part of the seat (18) 30 and the ball (23) of the tracing body (22) is formed from the tail in appearance of segment with radius (R), laying in the conic surface of the seat (18) and the upper part of the ball (23) is formed in appearance of semi-sphere with radius (R_1), smaller

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than radius (R) of the segment of the ball (23) and the centers of the radii R and R_1 are situated along the axle of the tracing element on the distance from each other equal to 1/5 from the radius 05 of semi-sphere R_1 .

2. Tracer hunting cartridge according to claim 1, characterized in that, the spindle (11) has the cylindric shape, on outside surface of which are formed, under a slope and symmetric 10 according the axle of the concentrator (6), stiffening ribs (27), staying on equal distances from each other.

3. Tracer hunting cartridge according to claim 1, characterized in that, the bottom of the cylindric hole in the tail (24) of the tracing body 15 (22) is formed in the plain of crossing of the segment with radius of the ball (23) and the cylindric tail (24).

4. Tracer hunting cartridge according to claim 1, characterized in that pressed in the tail 20 (24) pirotechnical tracing composition (25) is heterogeneous mixture, consists of magnesium powder 30-40 %, potassium perchlorate 10-20 %, strontium nitrate 35-45 % and connecting substance 5-15 %, expressed in mass soles.

5. Tracer hunting cartridge according to claim 1, 25 characterized in that, pirotechnical tracing composition (25) is heterogeneous mixture, consists of magnesium powder 15-35 %, barium superoxide 30-50 %, strontium nitrate 20-40 %, chlorine supplement 2-10 %, expressed in mass soles.

30 6. Tracer hunting cartridge according to claim 1, characterized in that, pirotechnical tracing composition (25) is heterogeneous mixture, consists of magnesium powder 15-35 %, potassium nitrate 40-60 %, strontium nitrate 20-30 %, chlorine supplement 2-10 % and

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connecting substance 5-15 %, expressed in mass soles.

7. Tracer hunting cartridge according to claim 1, characterized in that, the tail (24) are pressed-in consistently in direction from the base of the hole to its bottom, basic (25) and additional (26) pirotechnical compositions in the process of burning radiate light, which colour differed from the colour of the light of the basic trasing composition (25).

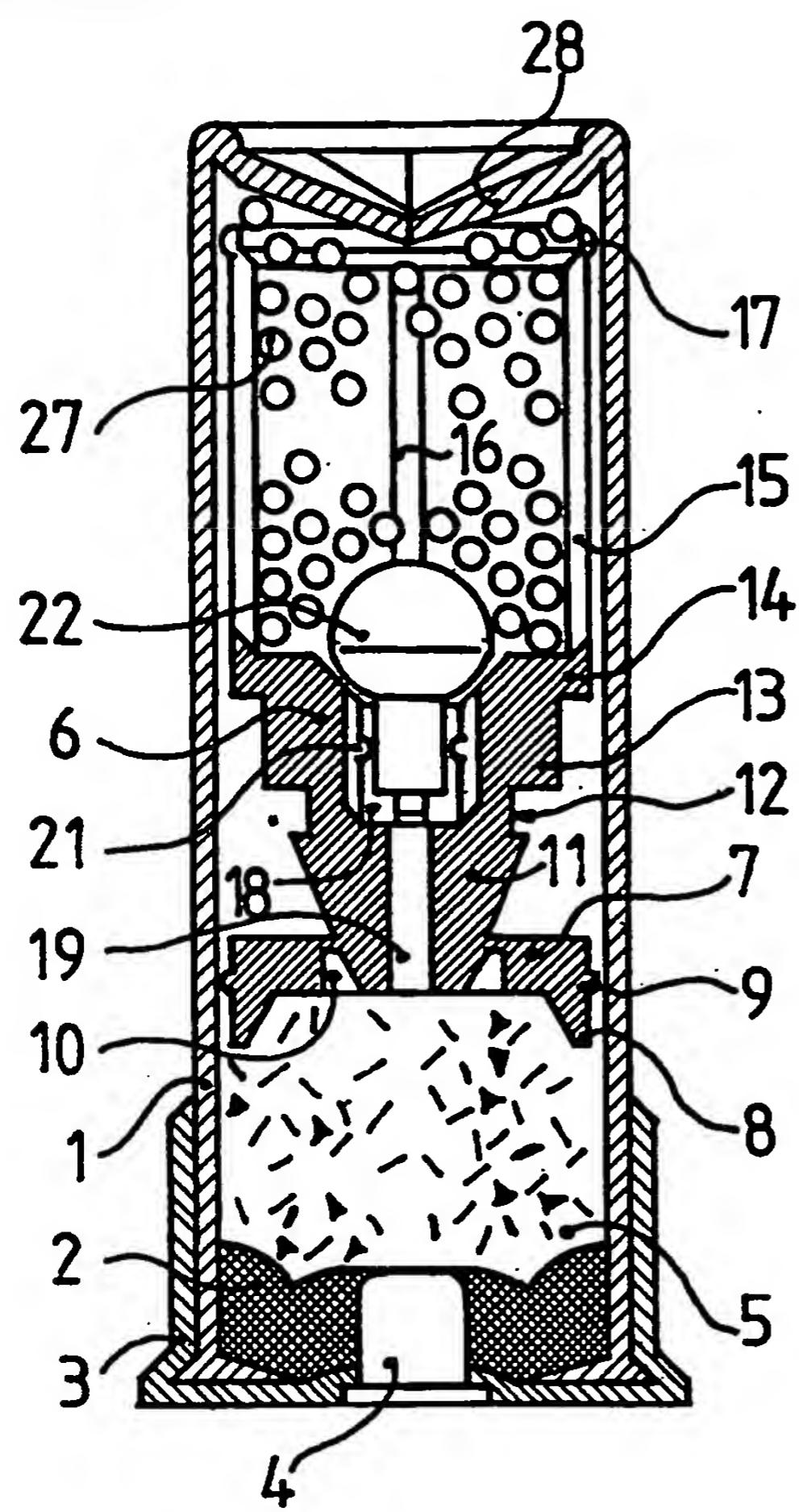


Fig. 1

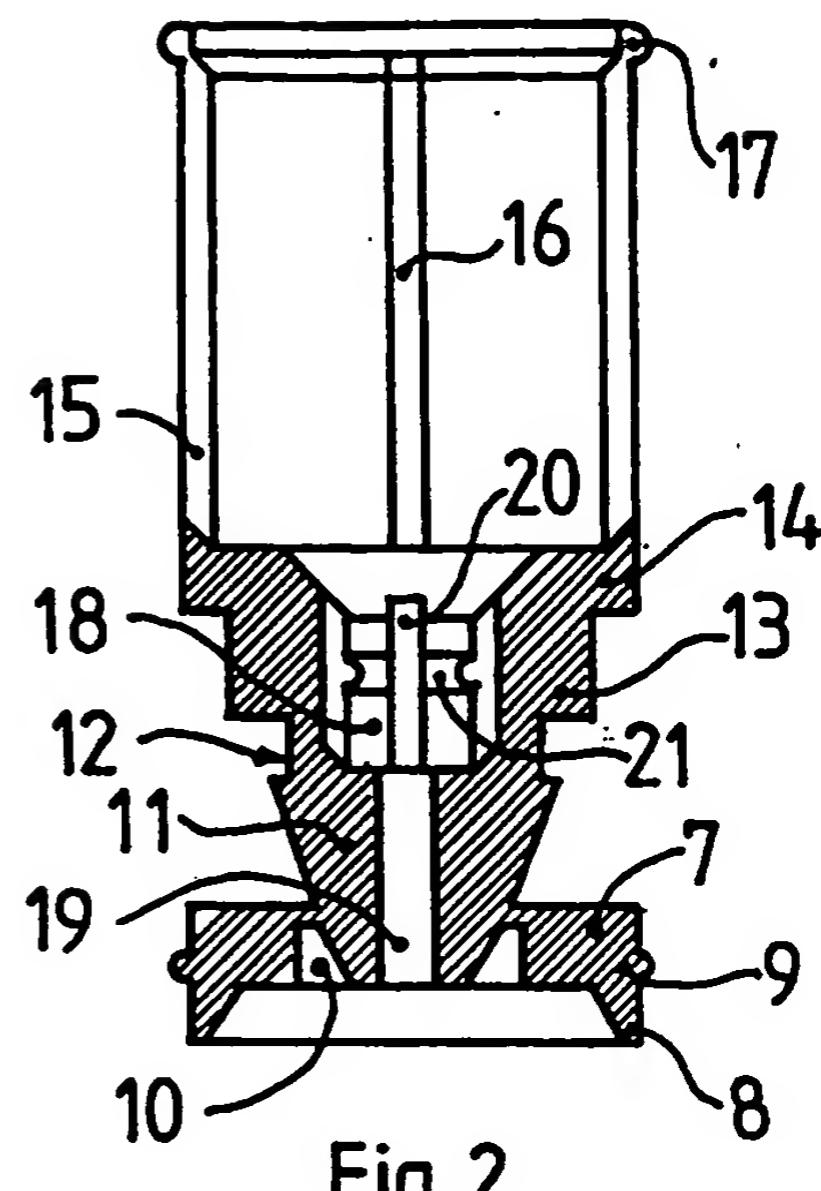


Fig. 2

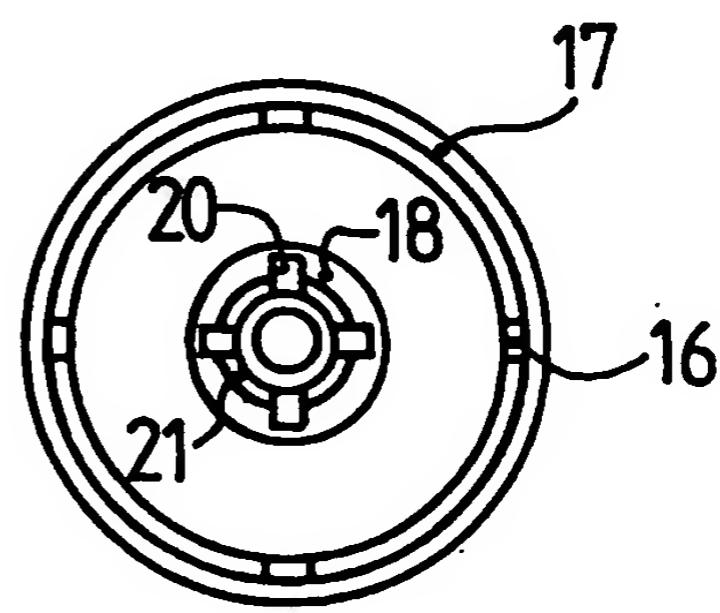


Fig. 3

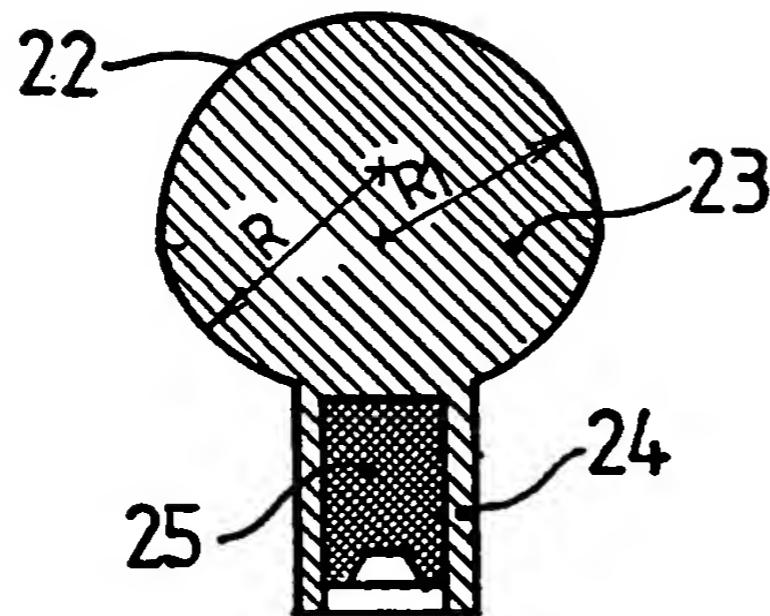


Fig. 4

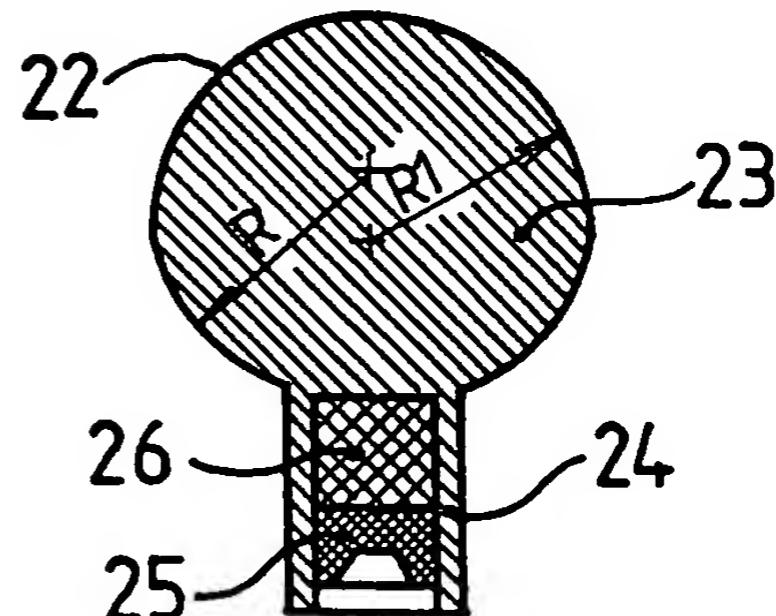


Fig. 5

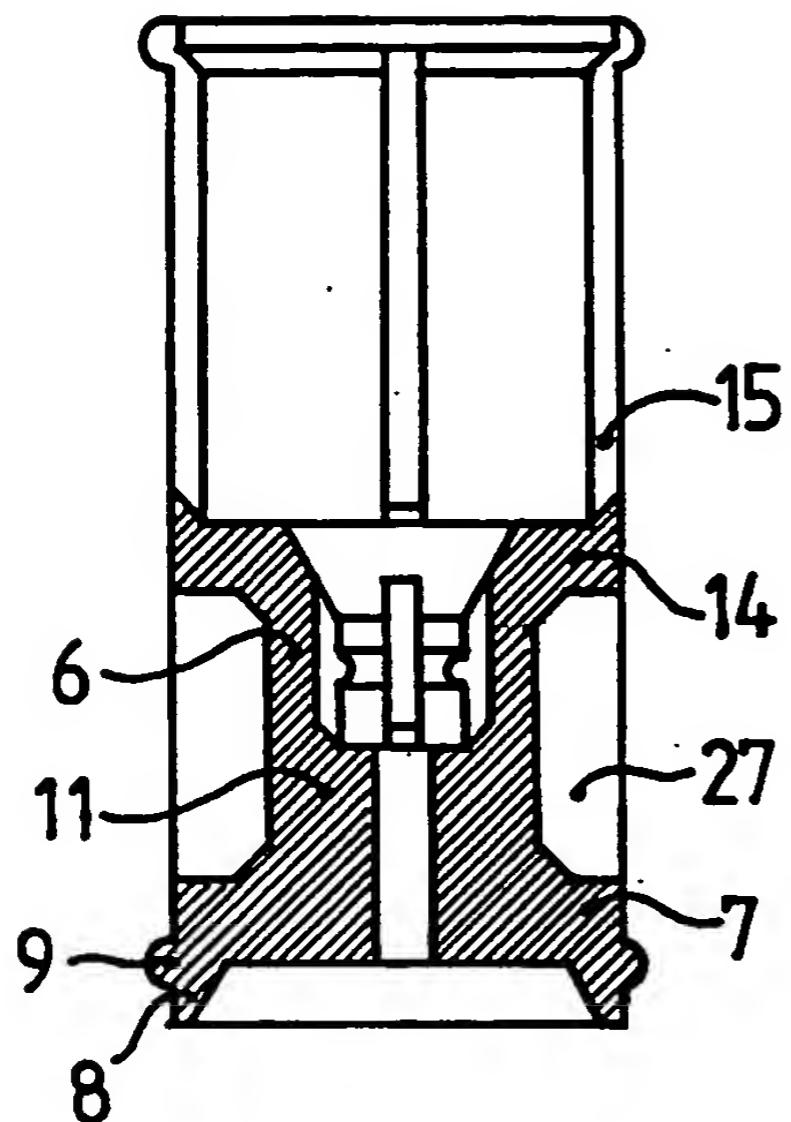


Fig.6

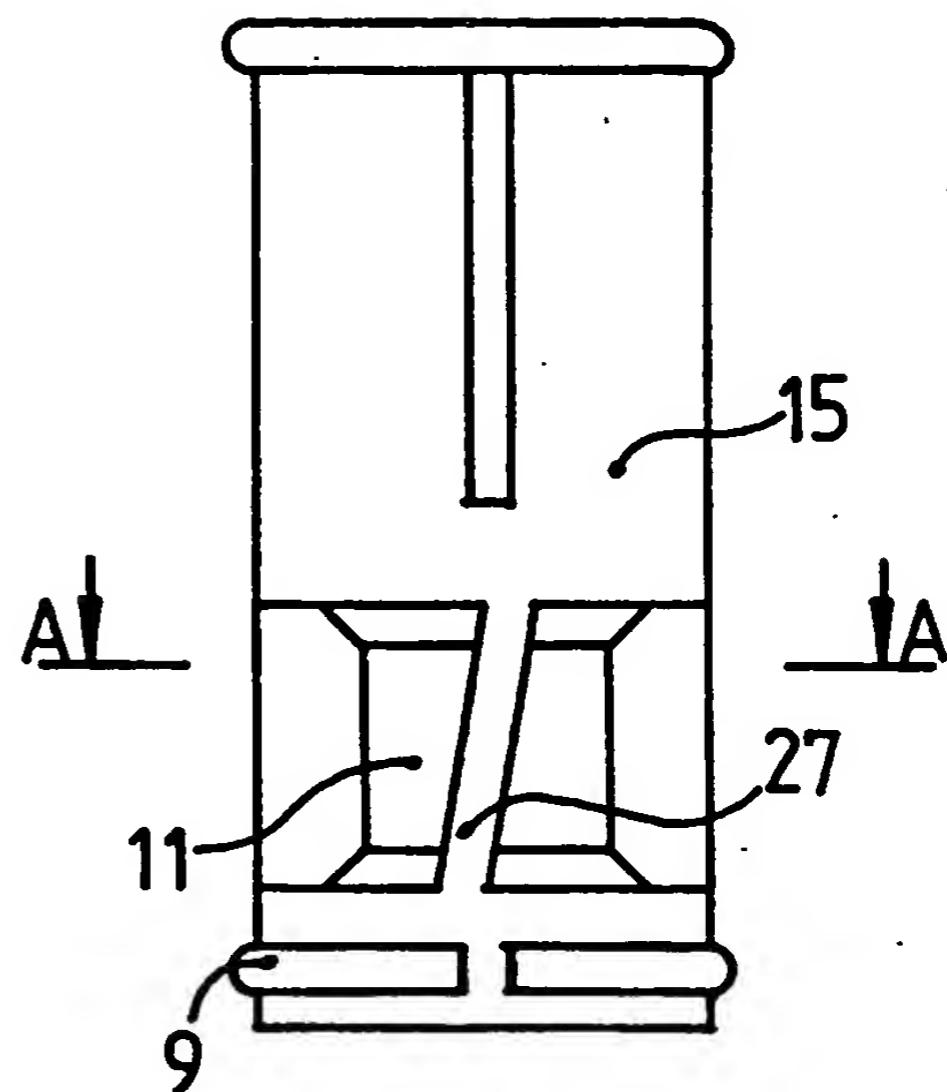


Fig.7

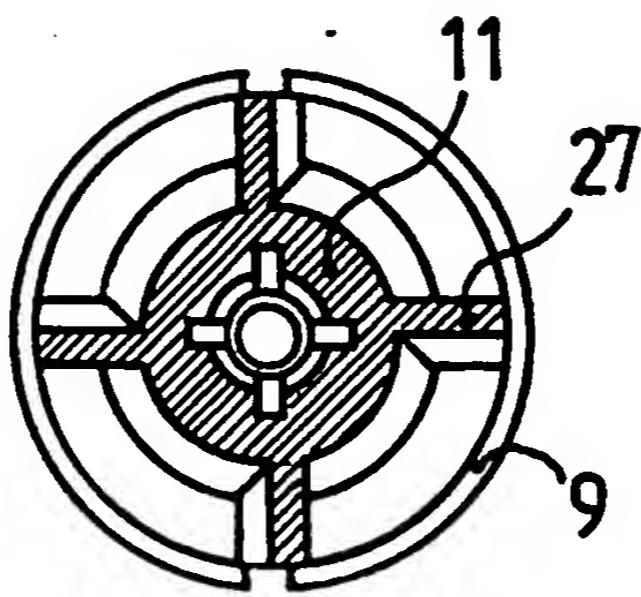


Fig.8

INTERNATIONAL SEARCH REPORT

International Application No
PCT/BG 94/00001

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 F42B7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 F42B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 841 866 (D. MIESNER) 27 June 1989 cited in the application see column 2, line 60 - column 3, line 65; figures 1-7 see column 4, line 9-30 ---	1-3
A	US,A,3 262 390 (OLIN MATHIESON CHEMICAL CORP) 26 July 1966 see column 3, line 9 - column 4, line 55; figures 1-5 ---	1-3
A	FR,A,2 203 968 (YURRITA GABILONDO) 17 May 1974 ---	1
A	FR,A,2 274 888 (J. ROIDE) 9 January 1976 ---	1

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